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(Reaffirmed 2018)

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लौह एवं इस्पात पारिभाषिक शब्दावली

भाग 4 स्पाट उत्पाद

(दूसरा पुनरीक्षण)

Indian Standard

GLOSSARY OF TERMS RELATING TO IRON AND STEEL

PART 4 FLAT PRODUCTS

(Second Revision)

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Wrought Steel Products Sectional Committee, MTD 04

FOREWORD

This Indian Standard (Part 4) (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Wrought Steel Products Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1962 and subsequently revised in 1975. While reviewing this standard, in the light of experience gained during these years, the Committee decided to revise it to bring in line with the present practices being followed by the Indian industry and corresponding International Standards on terminology.

In this revision the following changes have been made:

a) All the 4 amendments have been incorporated.
b) The requirements of IS 10340 : 1982 'Glossary of terms for cold-reduced tinplate and cold reduced blackplate' have been incorporated.
c) Plates have been defined.
d) Definitions of uncoated, metallic coated and other coated steel has been included.
e) Clause **3.1** covers process related definitions, clause **3.2** covers product related definitions and clause **3.3** covers defects related definitions.

This standard is published in eight parts. The other parts in the series are as follows:

Part 1 General metallurgy, heat treatment and testing
Part 2 Steel making
Part 3 Long products (including bars, rods, sections and wires)
Part 5 Bright steel bar and steel wire
Part 6 Forging (including drop forging)
Part 7 Wrought iron
Part 8 Steel tubes and pipes

Hence, IS 10340 : 1982 shall be withdrawn.

In the formulation of this standard assistance has been derived from the following International Standards:

ISO 6929 : 1987 Steel products — Definitions and classifications
BS EN 10079 : 2007 Definitions of steel products

Indian Standard

GLOSSARY OF TERMS RELATING TO IRON AND STEEL

PART 4 FLAT PRODUCTS

(Second Revision)

1 SCOPE

This standard (Part 4) is intended to convey the meanings of the terms commonly used related to process, product and defects in the field of flat steel products, uncoated and coated. All dimensions given in this standard are nominal.

2 REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revisions and parties to agreements based on these standards are encouraged to investigate the possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
513 : 2008	Cold reduced carbon steel sheets and strips (*fifth revision*)
1079 : 2009	Hot-rolled carbon steel sheet and strip (*sixth revision*)

3 TERMS AND DEFINITIONS

For the purpose of this standard the following terms shall apply.

3.1 Process Related

3.1.1 *Ageing* — It is susceptibility to changes in the properties with the passage of time. Ageing may result in an increase in yield strength and/or decrease in ductility during storage at room temperature.

3.1.2 *Annealing* — It is the process of heat treatment which involves heating the cold reduced steel to above the recrystallization temperature, maintaining for a suitable time, and then cooling under controlled conditions. Different annealing cycle may cause different changes in structure and thereby properties.

3.1.3 *Batch Annealing* — Annealing of cold-reduced strip in coil form, under a protective atmosphere.

3.1.4 *Black Annealing* — Annealing without use of any protective covering or controlled atmosphere. It is also termed as open annealing.

3.1.5 *Blanking* — Shearing/punching/piercing out flat pieces of any desired shape from sheet or strip.

3.1.6 *Blank Holder* — The device used to hold the blank-top to prevent wrinkling of the edges during pressing or drawing.

3.1.7 *Coiling* — The process of laying or winding the product in the form of coils.

3.1.8 *Cold-Reduction* — Reduction in thickness of sheet and strip by cold-rolling (*see also* **3.1.9**, **3.1.10**, **3.1.49** and **3.1.54**).

3.1.9 *Cold-Rolling (Cold-Reduction)* — Rolling steel (generally sheet or strip) below its recrystallization temperature with the degree of reduction being usually above 5 percent (*see also* **3.1.8**, **3.1.10**, **3.1.48** and **3.1.53**).

3.1.10 *Cold-Working* — Substantial mechanical working (usually above 5 percent), for example, drawing, rolling, forging, etc, of a metal or alloy below its recrystallization temperature (*see also* **3.1.8**, **3.1.9**, **3.1.48** and **3.1.53**).

3.1.11 *Continuous Annealing* — Annealing of cold-reduced strip in a single thickness within a protective atmosphere. This produces relatively stiffer product which exhibits a finer grain size than batch annealed material.

3.1.12 *Cropping* — Shearing off discard from the ends of products (*see also* **3.1.17**).

3.1.13 *Cross Rolling* — Rolling in the direction transverse to the longitudinal axis of the ingot or slab, as in the production of plate or sheet.

3.1.14 *Cutting* — Shearing into desired length or width of coiled strips after straightening. This also refers to the cutting of the edges of sheets.

3.1.15 *Descaling* — Removal of surface scale from a reheated/hot rolled/hot-worked/heat-treated metal stock by application of steam under high pressure/water/coal dust/brushwood/pickling/shot blasting/oil or pickling, shot blasting, etc.

3.1.16 *Scarfing* — The removal of surface defects from ingots/slabs or semi-finished products using an oxy-gas flame and/or grinding.

3.1.17 *Discard* — Those portions corresponding to the top and bottom of the ingot which are removed to ensure that the remainder of the material is of satisfactory quality. Also defective material produced in rolling or forging, to be cut off from one or both ends of the semi-finished or finished product (*see also* **3.1.12**).

3.1.18 *Doubling* — Folding a sheet or sheet-pack on itself, about the middle, before further rolling.

3.1.19 *Dressing* — Removing surface defects of an ingot, bloom, slab, etc, by chipping, scarfing, grinding or other methods.

3.1.20 *Edging* — The application of rolls to the edges of a flat product, for example, slab, plate, strip or flat, etc, with the object of controlling the width, and giving a smooth edge of desired contour during the rolling process.

3.1.21 *Electrogalvanizing* — It is a process in which a layer of zinc is deposited to steel electrolytically.

3.1.22 *Finishing Temperature* — The temperature at which hot-working is completed.

3.1.23 *Flow Brightening* — Process used to produce a bright surface on tin plated sheet by rapid melting of tin under controlled conditions of heating and quenching.

3.1.24 *Galvanizing* — Classically refers to zinc deposition process to steel articles to prevent rusting.

3.1.25 *Heat Treatment* — It is the process wherein a microstructure of the material is altered by predetermined heating and cooling cycle, causing changes in its properties such as strength and hardness.

3.1.26 *Hot-Dip Galvanizing* — It is a form of galvanizing. In this process, zinc coating is deposited by dipping/passing through its molten bath at 460°C.

3.1.27 *Hydraulic Flattening* — Levelling effected by means of stretching using hydraulic pressure.

3.1.28 *Line Inspection* — Final inspection of the finished product prior to its classification into the different quality grades. Inspection may be performed by instruments and/or visual examination.

3.1.29 *Matching* — In pack-rolling, the operation of placing parted sheets together to form a new pack in order that it can be so rolled that all the sheets in the pack are of the required gauge.

3.1.30 *Mill Shearing* — Edge shearing of sheet-pack to approximate size.

3.1.31 *Normalizing* — A heat treatment process that has the object of relieving internal stresses, refining the grain size and improving the mechanical properties. The steel is heated to austenizing temperature (>800^{0}C) according to its chemical composition, soaked at that temperature for requisite time and then air cooled.

3.1.32 *Normalizing Rolling* — A hot rolling process in which the final rolling passes are carried out at temperature above AR3 (Austenitic to ferritic transformation temperature), followed by cooling in natural air to a ambient temperature, in order to produce a structure analogous to that obtained by normalizing treatment of hot rolled product.

3.1.33 *Oiling* — Coating the steel with oil for temporary rust prevention.

3.1.34 *Oiling-Electrostatic* — Application of a very thin uniform oil film (generally dioctyl sebacate) to the surface of electrolytic tinplate by electrostatic deposition of fine oil particles from a mist.

3.1.35 *Opening* — Separating individual sheets processed by pack-rolling.

3.1.36 *Pack-Rolling* — Rolling two or more sheets at a time, in one pack.

3.1.37 *Passivation* — It is the process of making a material surface 'passive' to environment. Chemical or electrochemical treatment is applied to produce a stabilized surface of improved resistance to surface discoloration and superior lacquering and lithographic properties. An example of passivation process involves dipping of metallic coated steel item in chromate solution and making the surface passive and delay storage stain/white rust.

3.1.38 *Pickling* — The removal of scale/oxide by chemical or electrochemical treatment with dilute acids or other chemicals followed by washing.

3.1.39 *Pre-treatment* — The essential first stage treatment to a substrate before the application of coating. The adhesion performance of a coating is significantly influenced by it.

3.1.40 *Punching* — The process to punch through the material to create a hole of required size and shape in it.

3.1.41 *Resquaring (Reshearing)* — Shearing sheets to desired finished dimensions with right-angled edges.

3.1.42 *Roller Levelling (Mangling)* — Flattening of sheets by passing them through staggered rolls.

3.1.43 *Rolling* — The shaping of metal by passing it between rotating rolls and application of force.

3.1.44 *Roll Pass (Pass)* — Opening of definite shapes formed between a set of rolls through which steel passes for taking up the given shape or undergoing a desired amount of reduction in sectional area. This term also applied to a single passage through a pair of rolls for the purpose of altering the shape and/or reducing the cross-sectional area.

3.1.45 *Scale Breaking* — Breaking up of scale layer on slabs, blooms or billets during rolling by the application of water jets under pressure (descaling). This term is also used for the operation of breaking the scale by repeated reverse bends to the steel by passing through a suitable machine.

3.1.46 *Shearing* — This term is often used for 'cropping' which is done with shears (*see* **3.1.12**).

3.1.47 *Side Shearing (Edging)* — Shearing off the edges to obtain the desired width.

3.1.48 *Skin Passing (Pinch Passing)* — Light cold rolling of hot rolled/annealed/normalized/coated steel sheet/strip for improving surface quality, removing kinks stretcher strains or similar conditions on surface only (the cold reduction being very light, usually less than 5 percent) (*see also* **3.1.8**, **3.1.9**, **3.1.10** and **3.1.53**). The skin pass suppresses yield point elongation besides improving flatness. Some increase in hardness and some loss in ductility may result from skin passing.

3.1.49 *Slitting* — Cutting a strip into a number of narrower strips by means of rotary cutters.

3.1.50 *Strain Ageing* — Ageing which occurs subsequent to the cold working of an alloy. Strain ageing in steel is predominantly due to the presence of uncombined nitrogen, and results in a marked decrease in ductility.

3.1.51 *Stress Relieving* — Heating the metal below its recrystallization temperature and if required holding at that temperature followed by cooling for the sole purpose of removing internal stresses.

3.1.52 *Stretcher Levelling (Patent Flattening, Stretcher Flattening)* — Flattening of sheet/strip and thereby taking away buckles, warpage, kink, etc, by applying tension at a stretching machine/leveler.

3.1.53 *Temper Rolling* — Cold-rolling operation following annealing to produce different tempers/ hardness (*see also* **3.1.8**, **3.1.9**, **3.1.10** and **3.1.48**).

3.1.54 *Thermo-mechanical Rolling/Processing* — It is also known as thermo-mechanical treatment (TMT) is a metallurgical process which incorporates controlled deformation under specific thermal/heated condition.

3.1.55 *Trimming* — Cutting of a sheet/strip at one or both edge along the length by means of rotary cutters.

3.1.56 *White Pickling (Bright Pickling)* — The pickling of annealed sheets intended for tinplate and tern plate.

3.2 Terms and Definitions — Product Related

3.2.1 *Bar Weight* — Weight per unit length of sheet bar.

3.2.2 *Bare/Base Metal Thickness* — This is also termed as BMT (Base metal thickness). It is the thickness of hot/cold rolled strip in cut-length or coil form without any coating on it. In case of coated steel, it is measured after removing the coating. This is the thickness on which structure is designed and should be used while ordering the coated steel.

3.2.3 *Billet* — A semi-finished product obtained by forging, rolling or continuous casting, usually square and not exceeding 125 × 125 mm in cross section and is intended for further processing into suitable finished products by forging or re-rolling.

3.2.4 *Blackplate* (***see also*** **3.2.14**) — Unalloyed, low carbon steel sheet or strip, which has been single or double cold reduced. Single reduced blackplate is typically manufactured in thicknesses from 0.17 mm up to and including 0.49 mm, and double reduced blackplate in thicknesses from 0.14 mm up to and including 0.29 mm.

NOTE — Blackplate is normally used to manufacture tinplate or electrolytic chromium/chromium oxide coated steel (ECCS), but in certain packaging applications it may be used as such. In such cases the product must be suitable for varnishing (lacquering) or printing.

3.2.5 *Black Sheet or Strip* — Hot-rolled sheet or strip that is not descaled.

3.2.6 *Black Softened* — Hot or cold-rolled sheet and strip softened by black annealing, but not yet descaled (and usually refers to stainless variety).

3.2.7 *Backer Coat/Bottom/Reverse Side* — The surface of the pre-painted sheet, which is opposite to the exposed weathering surface (*see also* **3.2.78**).

3.2.8 *Bulk Package (Sometimes Erroneously Termed 'Stillage')* — Pack or multiple packing unit comprising stillage, tinplate and packaging material for the shipping of tinplate.

3.2.9 *Cast (Heat Melt)* — Usually the product of a single furnace charge. Sometimes the furnace contents are tapped into two or more ladles then the product of each ladle may be called a separate cast.

3.2.10 *Coated Steel* — Products which have been surface treated with a permanent coating. The permanent coatings may be applied:

a) on both surfaces of sheet/strip/plate:

  1) of equal coating mass/thickness on each surface;
  2) of different mass/thickness (differential coating); and

b) on one surface only.

3.2.11 *Coated Thickness* — Thickness of coated sheet in cut-length or coil form. This is also termed as TCT (Total Coated Thickness). This includes thickness of steel base and metallic coating and excludes the paint thickness, if any.

3.2.12 *Coil Coating* — A continuous process by which paint and other coatings are applied and oven-baked onto moving steel strip. The painted product of this process is referred to as pre-painted steel.

3.2.13 *Coiled Strip (Hot Rolled or Cold Rolled)* — A rolled flat strip product which is wound into regularly superimposed laps so as to form a coil with almost flat side. It shall have at least 50 laps.

3.2.14 *Cold-Reduced Blackplate* (***see also*** **3.2.4**) — Low carbon mild steel strip/sheet produced by continuous or semi-continuous cold reduction of hot-rolled steel strip/sheet.

3.2.15 *Cold-Reduced Hot-Dipped Tinplate* — Cold-reduced low carbon mild steel strip/sheet which has been tinned by the hot-dip tinning process.

3.2.16 *Cold-Reduced Electrolytic Tinplate* — Low carbon mild steel cold reduced strip/sheet which has been tinned by the electrolytic process.

3.2.17 *Cold Rolled* — Products generally obtained by the cold rolling of hot rolled finished products during which it would have undergone a reduction in cross-section of at least 25 percent without prior reheating. In the case of flat products of a width less than 600 mm and for certain qualities of special steel, levels of reduction of cross-section less than 25 percent may be included. It is further classified as follows:

a) *CRFH* — Cold rolled full hard produced by cold reduction of more than 50 percent.
b) *CRCA* — Cold rolled closed annealed.
c) *Skin passed* — Cold rolled and annealed have been given a very light cold rolling pass, normally less than 5 percent.
d) *Temper rolled* — Cold rolled and annealed have been given cold reduction of 5 percent to 50 percent.

3.2.18 *Commercial Quality Steel* — Steel intended for general fabricating purposes where it is used in the flat condition, or for bending or moderate forming.

3.2.19 *Composite Products* — It comprises the following:

a) Steel plate, sheet and strip cladded with steels or alloys in order to resist wear, chemical corrosion or heat distortion. Bonding is usually achieved by rolling, and more rarely by spraying, welding or explosion;
b) Sandwich steel sheet formed from two steel sheets bonded together by means of a synthetic insulating layer; and
c) Sandwich panels fabricated from two ribbed steel (usually coated steel) sheets bonded with an insulating layer inside.

3.2.20 *Conversion Coating* — A chemical treatment normally applied to a metal surface prior to final finishing, which is designed to react with and modify the metal to produce a surface suitable for painting.

3.2.21 *Deep Drawing (DD) Steel* — A quality low carbon steel possessing high ductility/formability, desirable grain size and shape, texture, etc, which permits deep drawing (*see* IS 1079 and IS 513).

3.2.22 *Differential Coating* — Coating having a coating mass/thickness on one surface that is significantly different from the coating mass/thickness on the other surface.

3.2.23 *Doubles* — Sheets hot-rolled after doubling.

3.2.24 *Drawing Steel* — Steel intended for parts where drawing or severe forming may be involved (*see* IS 1079 and IS 513).

3.2.25 *Electrical Steels* — Flat products which are distinguished from other flat products by the fact that they are intended for electromagnetic applications and their principal characteristic lies in the specified requirements with regard to specific permissible watt losses and sometimes magnetic induction and buckling factor. Their thickness is generally equal to or less than 3 mm and width equal to or less than 1 500 mm. There is a distinction between the following.

3.2.25.1 *Grain oriented products* — These show significantly improved magnetic properties in the rolling direction compared with those in the transverse direction, and are always supplied with an insulation coating on both surfaces.

3.2.25.2 *Non-grain oriented products* — These show similar magnetic properties in both the rolling and transverse directions, and may be supplied either uncoated or with an insulating coating on one or both surfaces.

NOTE — These may be supplied either;

a) in the semi-processed state with the required specific total loss achieved after the material has been annealed by the user according to a reference heat treatment; or

- b) in the finally annealed state with specific total loss. The product may be supplied uncoated or with an insulating coating on one or both surfaces.

3.2.26 *Extra Deep Drawing (EDD) Steel* — A superior quality low carbon deep drawing steel (*see* IS 1079 and IS 513).

3.2.27 *Extra Latten* — Hot-rolled sheet having thickness under 0.4 mm, that is, thickness under those for latten.

3.2.28 *Finish Coat* — Paint coat on the top surface of the pre-painted steel. This is also known as top-coat (*see also* **3.2.75**).

3.2.29 *Finished Product* — Rolled or forged products whose transformation in an iron and steel plant is completed. There cross-section is uniform and is often defined by a standard which fixes the ranges of nominal dimensions as well as the tolerance of form and dimensions. The outline of the cross-section and the surface finish is such that quite often the user has only to cut to the required dimensions.

3.2.30 *Flat Rolled Finished Products* — Products which have been manufactured generally by rolling and which are normally not further hot/cold worked in the steel works. Finished rolling mill products are of almost rectangular cross-section and with a width much greater than the thickness. The cross-section is uniform over the whole length. The size range and the tolerances on shape and dimensions are usually defined by product specific standards IS 1852 and IS 1730. The surface is generally smooth, but floor/chequerred plate, for example, may have a regularly raised or indented pattern.

3.2.31 *Gauge* — Thickness in terms of a standard gauge number or in any accepted unit.

3.2.32 *Gloss* — The luster, shine or reflecting ability of a surface.

3.2.33 *Grades*

3.2.33.1 *Standard grade (prime)* — Materials which at the time of despatch are free from defects readily visible to the unaided eye. Under normal conditions of storage and use, they are suitable for lacquering and painting over the whole surface.

3.2.33.2 *Second grade* — Seconds is the grade designation given to material which at the time of despatch have a minimum of 75 percent of usable area.

3.2.33.3 *Unassorted grade (standard)* — Unassorted (UA) is the grade designation given to material, normally produced in line using usual inspection and classification procedures. These contain primes and seconds. The quality of seconds may be up to 15 percent at the time of despatch.

3.2.33.4 *Menders* — Hot dipped or electrolytic tinplate, initially rejected for surface blemishes, which can be repaired or made good by re-tinning in the hot-dipping process.

3.2.33.5 *Unmended menders* — Electrolytic menders which have not been repaired by hot-dipped tinning. They have superficial defects mainly affecting the surface appearance, but they conform to the specified tin coating weight.

3.2.33.6 *Waste-waste*

3.2.33.6.1 *Assorted waste-waste (hot dipped and electrolytic)* — Tinplate which at the time of despatch may have visible imperfections of moderate magnitude or frequency, and is supplied assorted to size, gauge, tin coating and temper.

3.2.33.6.2 *Unassorted waste-waste (hot dipped and electrolytic)* — Tinplate which at the time of despatch may have visible imperfections of moderate magnitude or frequency. This material is generally supplied in mixed sizes, tempers and thickness and may be off the tolerance in tin coating masses and can be a mixture of bright, matt or stone finish.

3.2.33.6.3 *Mill excess or mill over runs* — These are tinplates of standard grade (unassorted grade) accumulating in the mills as a result of production having exceeded specific order, cancellation of orders, etc, and supplied assorted in terms of size, gauge and temper.

3.2.34 *Hot Rolled* — Products obtained by hot rolling of semi-finished products and, more rarely, by hot rolling of crude products. This hot rolled could be with/without pickling and oiling. Hot rolled pickled and oiled is termed as HRPO. Hot rolled flat products also include those which have been given a very light cold rolling pass, normally less than 5 percent, known as a skin-pass or dressing pass. HRSPO stands for Hot rolled pickled, oiled and skin passed.

3.2.35 *Inorganic Coated Sheet and Strip* — It comprise of,

- a) *Chromated sheet/plate and strip* — The mass of the coating of chromate varies from 1 to 20 g/m^2 per surface;
- b) *Phosphated sheet/plate and strip* — The mass of the coating of phosphate varies from 1 to 20 g/m^2 per surface; and
- c) *Sheet/plate and strip with miscellaneous inorganic coatings* — For example vitreous enameled products.

NOTE — Products with a lesser coating thickness of chromate or phosphate are described as passivated by chromating or phosphating. They do not belong to the category of products, which have undergone surface treatment, but to the category of products, which have not undergone surface treatment (*see also* **3.2.10**).

3.2.36 *Lattens* — A measure of thickness and refers to those hot-rolled sheets having thickness from 0.56 mm to 0.4 mm.

3.2.37 *List Edge (or Drip)* — The trailing edge of the sheet during passage through the hot-dip tinning bath. Due to the effect of tin flow and surface tension, the plate, on emergence from the molten tin, carries a thicker tin coating at this edge. Generally the list-edge is deemed to start at the point where the thickness of the sheet has increased by 0.10 mm.

3.2.38 *Metallic Coated Steel* — Steel having metal or alloy coating covering its major surface area for example, Galvanised steel, 55 percent Al-Zinc alloy coated steel, etc.

3.2.38.1 *Tinplate* — Low carbon steel sheet and strip of thickness less than 0.50 mm, and coated on both surfaces with tin either by hot dipping (dipping in a bath of molten tin) or electrolytically.

3.2.38.2 *Tin coated sheet and strip* — Low carbon steel sheet or strip of thickness 0.50 mm or over, and Tin coated on both surfaces.

3.2.38.3 *Electrolytic chromium/chromium oxide-coated sheet and strip (ECCS)* — Low carbon steel sheet or strip of thickness less than 0.50 mm, and coated on both surfaces with a duplex film of metallic chromium adjacent to the steel substrate with an outer layer of hydrated oxide or hydroxide.

NOTE — Electrolytic chromium/chromium oxide coated steel sheet or strip is normally supplied with a protective coating of oil and is suitable for varnishing (lacquering) or printing.

3.2.38.4 *Zinc coated sheet and strip* — Sheet and strip coated with zinc:

a) *By dipping in a bath of molten zinc* — The mass of the zinc varies in general between 120 and 600 g/m^2 total on both surfaces.
    1) The Zinc coating may have a spangle finish, minimized spangle or be without spangle. This product is generally called as Galvanised Iron (GI).
    2) The coating through thickness may have varying amount of Iron with Zinc. This is usually called as Galvannealed steel.
b) *Electrolytically* — The mass of the Zinc varies in general between 7 and 107 g/m^2 per surface, which corresponds to a coating thickness of 1 to 15 micrometer (µm) per surface.

After zinc coating, the surfaces may be passivated by chromate or phosphate and/or resin coated. This surface treatment does not alter the classification of these products in the category of zinc coated steel sheet and strip.

3.2.38.5 *Aluminium/aluminium-silicon alloy coated sheet and strip* — Sheet and strip coated with aluminium or an aluminium-silicon alloy by dipping in a molten bath. The mass of the alloy varies in general between 80 and 300 g/m^2 total both surfaces, which corresponds to a coating thickness of 15 to 55 µm per surface.

3.2.38.6 *Lead-tin alloy coated sheet and strip (terne coated steel)* — Sheet and strip coated with lead-tin alloy either by dipping in a bath of molten alloy or electrolytically. In general, the highest nominal mass specified for the coating corresponds to a minimum of 120 g/m^2 total of both surfaces.

3.2.38.7 *Aluminium-zinc alloy coated sheet and strip* — Sheet and strip coated with aluminium-zinc alloy by dipping in a bath of molten alloy. The mass of the alloy coating varies in general between 70 and 450 g/m^2 total of both surfaces. According to the aluminium content a distinction is made between:

a) Aluminium-zinc alloys (aluminium ≥50 percent); and
b) Zinc-aluminium alloys (aluminium over 3 percent to 50 percent).

3.2.38.8 *Zinc-nickel alloy coated sheet and strip* — Sheet and strip coated electrolytically with a zinc-nickel alloy, with a coating thickness generally between 1 and 8.5 µm per surface.

3.2.39 *Mill Coil* — The long narrow hot-rolled strip produced from one single billet or slab.

3.2.40 *Mill Edge* — The edge as obtained from the normal practice of rolling without the use of edge rolls.

3.2.41 *Mill Finish* — The surface finish on sheets corresponding to the ground finish of rolls used.

3.2.42 *Mill Pack* — Sheets from pack-rolling.

3.2.43 *Minimized Spangle* — Finer metallurgical coating formed as a result of treatment to restrict the formation of the normal coarse-grain coating structure.

3.2.44 *Narrow Strip* — A hot or cold rolled strip of width normally less than 600 mm.

3.2.45 *Normal Spangle* — Coating formed as a result of unrestricted growth of aluminium/zinc crystals during normal solidification of metallic coating.

3.2.46 *Organic Coated Sheet and Strip* — Uncoated or metallic coated (for example Zinc/Zn-Al coated) sheet and strip, subsequently coated with an organic material or a mixture of metal powder and organic material by either of the following continuous processes:

a) By the application of one or more coats of paint (termed as pre-painted) or other type of product; after drying, the thickness of the coating varies according to its character from 2 to 400 m per surface.

b) By the application of an adhesive film, whether or not followed by a coating of organic materials. The coating may have different surface designs and a thickness generally between 35 and 500 m per surface.

3.2.47 *Pairs* — Two sheets hot-rolled together.

3.2.48 *Plate and Sheet* — A hot or cold-rolled flat product rolled in rectangular cross-section. The edges being allowed to deform freely, supplied flat in straight lengths and generally in a square or rectangular shape, but also in any other shape, for example circular or according to the design sketch. The edges may be as-rolled (mill edge) or trimmed or sheared or flame-cut or chamfered. The product may also be delivered pre-curved. Plate and sheet may be produced,

a) directly on a reversing mill, or by cutting from a parent plate rolled on a reversing mill; and
b) from strip by cutting it to length.

NOTES

1 Plate produced on a reversing mill is known generally as quarto plate.

2 Plate and sheet produced on a continuous mill is known generally as plate and sheet.

3 Plate and sheet are defined according to the thickness as below:

1) *Plate* — Thickness 5 mm or over.
2) *Sheet* — Thickness less than 5 mm.

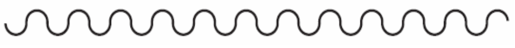
3.2.49 *Primer* — The first complete layer of paint of a coating system applied to metallic surface. This serves as the bond between the substrate and topcoat/backer-coat and offers added corrosion prevention.

3.2.50 *Primes* — Products of good quality, free from harmful defects.

3.2.51 *Profiled Sheets* — Products having various cross-sectional shapes, constant along their total length, made from coated or uncoated hot or cold rolled flat material by cold-forming process (for example roll forming, crimping, etc). These have a cross-section distinctly greater in width than height and normally showing along their total length several parallel undulations of constant cross-section.

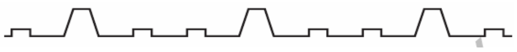
NOTE — A distinction is made between,

a) *Corrugated sheet* — Products showing large or small longitudinal corrugations, mainly used for cladding, flooring and roofing (Fig. 1A);



1A Corrugated Sheet

b) *Ribbed sheet* — Products with rectangular or trapezoidal longitudinal ribs (Fig. 1B).



1B Ribbed Sheet

FIG. 1 PROFILED SHEETS

3.2.52 *Rolled Edge* — Edge which is finished accurately to desired shape by using rolls at the edges.

3.2.53 *Rolling Width* — The dimension at right angles to the rolling direction.

3.2.54 *Shear Out Dimension* — The dimension parallel to the rolling direction.

3.2.55 *Sheared Edges* — Edges detached by shearing (and at times by slitting wheel).

3.2.56 *Sheet* (*see* **3.2.50**)

3.2.57 *Sheet Bar (Slab Bar)* — Semi-finished product of rectangular section, of thickness not less than 6 mm, width not less than 150 mm and of such dimensions that the thickness does not exceed one quarter of the width. This term also includes the product tin plate bars.

3.2.58 *Sheet Bar, Multiple* — A sheet bar of such length as to give a desired number of smaller sheet bars after shearing or cutting with minimum wastage (due to short length).

3.2.59 *Short (Cut Bar)* — The portion left out after specified lengths/widths are cut out or sheared from a hot/cold rolled products.

3.2.60 *Singles* — Sheets hot-rolled individually, that is, not in pack.

3.2.61 *Skelp* — Skelp is Narrow strip (*see* **3.2.65.1**).

NOTE — Skelp is historically coined from the word 'skelping' an operation in which long narrow strip was beaten into the shape of a tube which was heated to a very high temperature and rolled, resulting in forge welding of the seam.

3.2.62 *Slab* — Flat semi-finished products in rectangular section of thickness generally equal to or greater than 150-250 mm and with a ratio of width to thickness equal to or greater than 2. Slabs with a ratio of width to thickness greater than 4 are called 'flat slabs'.

3.2.63 *Smooth Finish* — Smooth coating produced by skin passing the coated material in order to achieve an improved surface condition compared with the normal as-coated product.

3.2.64 *Soft Temper* — In a soft condition (as induced by annealing) (*see also* **2.2.71**).

3.2.65 *Strip* — A hot or cold rolled flat product and rolled approximately in rectangular cross-section with mill, rolled, trimmed or sheared edges and supplied in coil form.

3.2.65.1 *Narrow Strip* — A hot or cold rolled strip of width normally less than 600 mm.

3.2.65.2 *Wide Strip* — A hot or cold rolled strip of width normally equal to or greater than 600 mm.

3.2.66 *Substrate* — Base of coated steel on which coating has been applied.

3.2.67 *Standard Unit Area of Tinplate (SITA)* — Area of 100 m^2 of tinplate is equal to one SITA (System International Tinplate Area).

3.2.68 *Stillage (Sometimes Erroneously Termed 'Bulk')* — Wooden base platform on which tinplate sheets are stocked to facilitate packing and ready transportation.

3.2.69 *Temper* — A characteristic condition, associated with the mechanical properties and structure which are induced by mechanical or thermal treatment (or both). A given product may be fully annealed (that is of soft temper) or subjected to a very drastic cold deformation (hard temper), or treated to a condition intermediate between these two extremes to bring about the desired temper (namely, quarter hard, half hard and three-quarter hard) depending on treatment.

3.2.70 *Thin Slab* — Slabs with thickness of 35 mm-50 mm (*see also* **3.2.62**).

3.2.71 *Tinplate Strips* — In coated low carbon steel sheets in which the length is many times the breadth. These are essentially cuttings/arisings from unassorted and assorted waste-waste quality tinplate and are generally sold without specifications excepting for the range of thickness and dimensions.

3.2.72 *Tolerances* — The permitted deviation from a specified dimension or weight usually expressed as plus or minus on that quantity.

3.2.73 *Top-Coat* — The surface of the pre-painted steel, which is/will be exposed to external or internal weathering (*see also* **3.2.28**).

3.2.74 *Uncoated Steel* — Products which have not undergone any surface treatment, apart from those products which may have been pickled/mechanically cleaned/received a simple coating for protection against corrosion or mechanical damage in handling or storage, or to facilitate their use.

The simple protective coating may be produced, for example, by one of the following methods:

a) *Passivation (with chromic or phosphoric acid)* — The product is electrochemically or chemically coated with a layer of chromate or phosphate; as distinct from surface treatment by chromating or phosphating (*see* **3.2.35**), the layer deposited is so thin as to be hardly discernible by optical means (7 to 10 mg/m^2 per surface);

b) *Application of an organic coating* — the coating itself offers no protection against corrosion but serves as a surface preparation for the subsequent application of other undercoats or coatings forming part of an anti-corrosion system;

c) Application of protective films, for example adhesive coating, adhesive paper, lacquer; and

d) Application of a film of grease, oil, tar, asphalt, lime or any soluble material.

3.2.75 *Unit (Packaging)* — Given No. of sheets of specified dimensions.

3.2.76 *Wash-Coat* — A thin paint on the bottom surface of the pre-painted steel. This is also known as backer-coat (*see also* **3.2.7**).

3.2.77 *Wide Flat* — Hot rolled flat product of width greater than 150 mm and a thickness generally over 4 mm, always supplied in lengths, that is not coiled. The edges are sharp; the wide flat is not rolled on the four sided (or in box passes) or produced by shearing or flame-cutting wider flat products. Wide flats rolled on all four sides are sometimes termed as universal plate.

3.2.78 *Wide Strip* — A hot or cold rolled strip of width normally equal to or greater than 600 mm.

3.2.79 *Wrap* — The single turn in a coil.

3.3 Terms and Definitions — Defects Related

3.3.1 *Acid Brittleness* — Brittleness induced in sheet and strip pickled in acid solution to remove scale or during electroplating. This is commonly attributed to absorption of hydrogen.

3.3.2 *Black Edges* — The black colouration at the edge of annealed sheets and strips caused by oxidation or due to soot deposit.

3.3.3 *Black Patches* — Patches of scale left on sheet and strip surface due to unsatisfactory pickling.

3.3.4 *Blister* — A layer of steel with a protuberance on the surface underneath which is a cavity due to accumulated gas.

3.3.5 *Blued Edges* — Blue or bluish-black discoloration at the edges of sheets and strips arising due to oxidation during heat treatment in the absence/lack of protective medium.

3.3.6 *Bow* — The greatest deviation from a straight line along a longitudinal edge in a sheet or strip.

3.3.7 *Buckling* — The bending of sheet or plates under compressive load.

3.3.8 *Burnt Edges* — Broken edges occurring during hot-rolling and caused by overheating or burning (*see also* **3.3.16**).

3.3.9 *Burr* — The sharp fringe of metal left on a sheared or saw cut bottom edge (*see also* **3.3.22**).

3.3.10 *Burst Edges* — Edges of sheet or strip ruptured due to excessive cold rolling.

3.3.11 *Butt* — Short-ingot or portions removed by sheering, cutting or punching from rolled, forged or pressed products for obtaining near correct size or shape.

3.3.12 *Camber* — The curvature observed in long rolled products caused by differential cooling or faulty setting of the rolls. It is measured by the maximum deviation of the middle region from the straight line joining the corresponding points on the two bounding sides.

3.3.13 *Chalking* — The formation on a pigmented coating of a friable powder evolved from the film itself at or just beneath the surface.

3.3.14 *Checked Edges* — Cracked edges in sheet bars and strips (occurring during hot-rolling) (*see also* **3.3.16**).

3.3.15 *Coil Breaks (Cross Breaks)* — The transverse kinks developing during straightening of coils of strips (hot-rolled or annealed).

3.3.16 *Cracked Edges* — Cracks across the edges (that is, at right angles to the direction of rolling) of rolled products. The term 'broken edges' is used in connection with large sections such as blooms, billets and slabs (*see also* **3.3.8**).

3.3.17 *Cross Breaks* — See **3.3.15**.

3.3.18 *Dings* — Kinks on sheet surface.

3.3.19 *Dog Leg* — 'Bow-legged' strip, that is, a strip which has been curved in opposite directions in two adjoining portions.

3.3.20 *Ears* — The wavy projections formed in deep-drawing which normally occur in geometric positions either at 45° or at 0° and 90° to the direction of rolling. These are caused by directional properties in the sheet.

3.3.21 *Fading* — Loss in colour intensity experienced by paint over time, generally due to the effect of ultra-violet radiation.

3.3.22 *Flash (Burr, Flash)* — Sharp and jagged edges left after shearing or sawing (*see also* **3.3.9**).

3.3.23 *Flatting (Kinking)* — The sudden yielding, with simultaneous appearance of stretcher strain markings, taking place in hot-rolled or annealed sheet or strips when deformed.

3.3.24 *Full Strip* — Strip in which the edges are shorter than the middle, thus causing distortion of the cross-section.

3.3.25 *Galling* — Galling, often referred to as 'Road burn' in the transport industry is a roughened area on the strip or sheet surface that can vary in size, severity and extent. It is the unintentional roughening or abrasion of metal or organic finished steel surfaces where rubbing (under pressure) results from relative movement of adjacent strip or sheet surface during transportation by road, rail, etc. These roughened areas can be individual spots, patches of spots or areas. In the worst case galling can result in total removal of metallic coating and paint film in the galled area.

3.3.26 *Ghost* — A segregated streak, usually containing a concentration of sulphide, phosphide, oxide, etc, which have become elongated during rolling or forging. This looks different in colour than the rest of the sheet when sheet is tarnished.

3.3.27 *Grease Mark* — Marking on the rolled surface caused by the presence of grease patch.

3.3.28 *Guide Mark (Guide Score, Guide Scratch, Guide Shearing)* — A surface defect resulting from abrasion between the steel/iron and a guide used for ensuring location in rolling.

3.3.29 *Inclusion (Non-metallic inclusions)* — Particles of oxides, sulphides, silicates, refractories, etc, embedded in the metal. These are the products of deoxidation.

3.3.30 *Inverse Segregation* — See **3.3.53**.

3.3.31 *Kisser* — Patches of scale left on sheets after pickling. This results from two sheets having remained in close contact during pickling.

3.3.32 *Lamination* — A defect in rolled materials, characterized by a tendency to split into layers along the direction of rolling usually due to the presence of non-metallic inclusions or other discontinuity in the steel.

3.3.33 *Marring* — Marring is characterized by a surface pattern of small shiny areas (higher gloss) generally over the entire surface. These shiny areas can vary in shape and size depending on the surface finish being painted, paint type and gloss. The rougher the surface finish on the material to be painted, the more prone it is to marring. It is caused by,

a) rougher than normal paint finish due to poor paint flow, and

b) painted strip being recoiled too hot. Marring is more prone on certain paint types.

3.3.34 *Off gauge* — Outside the permissible tolerance in thickness.

3.3.35 *Out of Squarness* — Sheet diagonals are not same.

3.3.36 *Orange Peel* — Characteristic roughening over the surface of cold-rolled or cold-deformed sheet or strip due to coarse grain size.

3.3.37 *Over-Pickled* — Pickled longer than necessary, resulting in pronounced chemical attack causing pitting and roughness on the surface.

3.3.38 *Phosphide Streak* — An elongated area of segregated phosphides which is revealed on etching.

3.3.39 *Pick-off* — Pick-off are small irregular shaped areas up to 1-5 mm in size where the metal coating has been completely removed from the strip surface exposing the steel/alloy base. They only occur on the bottom surface and mainly in the centre which is the hottest part of the strip and can be continuous throughout a coil varying in severity and frequency.

3.3.40 *Pickup/Pickup Mark* — It is a repetitive crater or depression on one or both surface of the strip and can be throughout the coil. It is a result of bits of metal or other foreign matter adhering to or embedding on any roll in the manufacturing line and imprinting into the strip surface once per revolution of the roll involved. The distance between the depressions is determined by the roll diameters.

3.3.41 *Pickle Stain* — Surface stain after pickling due to inadequate washing and drying.

3.3.42 *Pinch* — An overlap in a sheet caused by uneven heating of a pack of sheets prior to pack-rolling.

3.3.43 *Pinchers* — Surface disturbances which result from the rolling process and which ordinarily appear as fernlike ripples running diagonally across the direction of rolling.

3.3.44 *Pinholes* — Pinholes are small spots, which can occur anywhere over the coated strip surface in patches or clusters. It is caused by coating not adhering to material due to the roughness or other imperfection on the surface. Coating fails to wet the substrate surface causing a pinhole defect.

3.3.45 *Pipe (Contraction Cavity, Shrinkage Cavity)* — An axial cavity caused by contraction during solidification of an ingot and also the defect arising from the axial cavity in semi-finished or finished products.

3.3.46 *Roke (Roak)* — A longitudinal surface defect (an elongated fissure), caused by a blow-hole which is not welded up during rolling and has perforated the surface and become oxidized.

3.3.47 *Rolled-in-Scale* — Local areas of scale pressed into the surface of the stock during rolling.

3.3.48 *Roll Marks* — Periodic surface defects due to some imperfection on the surface of a roll or due to particles of matter picked up by rolls.

3.3.49 *Rust* — Rusting is the most common corrosion. Different metals may undergo equivalent corrosion, but the resulting oxides are not commonly called rust. Rusting is the term used for corrosion of iron and steel products only.

3.3.50 *Sand Marks* — Patches of furnace refractory material embedded on the surface of hot steel and rolled subsequently.

3.3.51 *Scraped Edge* — An edge with abrasion markings due to incorrect setting of guides.

3.3.52 *Seam* — Long shallow groove or striation formed during rolling by the elongation of oxidized surface or subsurface blow-holes. Seams may also be caused by rippled surfaces or by recurrent teeming laps.

3.3.53 *Segregation* — A non-uniform distribution of some constituents and/or impurities, in a cast product characterized by the mode of solidification of alloys. Segregation usually persists through subsequent hot and cold working. Generally the concentration of low melting constituents tends to be higher at the centre than the surface. Sometimes, the reverse of this phenomenon takes place and is known as inverse segregation.

3.3.54 *Shell (Scab, Sliver, Spill)* — A relatively thin film, or tongue of metal imperfectly attached to the surface of steel. The defect on the sides of the ingot, caused by metal splashed during teeming, having solidified and stuck to mould wall is also called shell or splash.

3.3.55 *Short (Cut Bar)* — The portion left out after specified length/width are cut out or sheared from hot/cold rolled products.

3.3.56 *Sticking* — The joining up of two adjacent surfaces, due to partial welding of pack-rolled or batch-annealed sheets.

3.3.57 *Stretcher Strains (Luder Lines)* — The roughening and somewhat furrowed appearance on the surface of low carbon sheets or strips as a result or uneven spreading in the initial stages of cold-deformation after annealing, normalizing or after hot-rolling, though being not so marked in the last two cases.

3.3.58 *Swarf Staining* — Swarf stains are minor manifestations of corrosion of the left over metallic particles/swarf on the surfaces of coated materials. Severe case can lead to reduced life of the coated material.

3.3.59 *Sweep* — Controlled deviation in dimensions in any particular region or place with respect to the remainder of the material. In rolls, sweep refers to the camber at the middle. In sheets, sweep refers to controlled dishing of a load of sheets for annealing to ensure flatness in the finally processed sheets.

3.3.60 *Trickle Scale (Tail Scale)* — Loose scale which flakes off from the ends during hot-rolling or packs of pairs of sheets and finds its way in between the sheets and is rolled in during further pack-rolling.

3.3.61 *Twisted Strip* — A strip with deformed and irregular cross-section.

3.3.62 *Uncoated* — Uncoated are areas devoid of coating. This could be in varying in size, shape and frequency on one or both surfaces of the strip and can be continuous or patchy throughout the length.

3.3.63 *Undercutting (Painted Product)* — Corrosion of the substrate under a paint film at a score mark or sheared edge where corrosive agents can gain access to the metal.

3.3.64 *Wedge Section (Wedge Shape)* — Strip with gradual change in thickness along the width.

3.3.65 *White Rust* — White rust is corrosion of zinc in coating on steel. It occurs due to formation of a basic zinc carbonate complex on zinc surfaces in moist atmosphere when unprotected by surface passivation.

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